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Dr. Middleton PHYS 132 HW
2-22-17 Ch.29

Ch. 29
Probs # 26, 29, 60

Problems

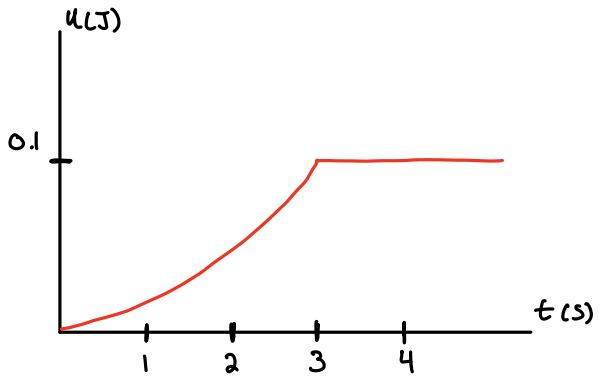
29.P.26

$$u_C = \frac{Q^2}{2C}$$

$Q = 200\times10^{-6}\,C$
$C = 2\times10^{-6}\,F$

$$u_C = \frac{(200\times10^{-6}\,C)^2}{2(2.0\times10^{-6}\,F)}$$

$u_C = 0.1\,J$



$u_C = Kt^2$

29.P.29

$$u_C = \frac{Q^2}{2C} \qquad \frac{1}{2}C\Delta V^2 = u_{stored}$$

a. $\vec{E} = \frac{n}{\epsilon_0}$ $\quad C = \frac{Q}{\Delta V}$ $\quad \Delta V = 200V$ $\quad C = \frac{\epsilon_0 A}{d}$

$A = \pi(1.0\times10^{-2}\,m)^2$
$A = 3.14159\times10^{-4}$
$d = 0.5\times10^{-3}\,m$
$\epsilon_0 = 8.85\times10^{-12}\,\frac{C^2}{nm^2}$

$C = 5.5606\times10^{-12}\,F$

$Q = C\Delta V$
$Q = 1.1121\times10^{-9}\,C$

$0.5(5.5606\times10^{-12}\,F)(200\,V)^2 = u_C$

$u_C = 1.12\times10^{-7}\,J$

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b. $u = \frac{1}{2}\epsilon_0 E^2$

$E = \frac{Q}{A\epsilon_0}$ $\quad E = \frac{1.1121\times10^{-9}\,C}{(3.14159\times10^{-4}\,m^2)(8.85\times10^{-12}\,\frac{C^2}{nm^2})}$

$E = 399{,}992\,N/C$

$u = \frac{1}{2}(8.85\times10^{-12}\,\frac{C^2}{nm^2})(399{,}992\,N/C)^2$

$u = 0.7079\,J/m^3$

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29.P.60

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} \qquad C_{eq} = \frac{C_1C_2}{C_2+C_1}$$

$$\frac{1}{C_{eq}} = \frac{C_2+C_1}{C_1C_2} \qquad \frac{Q}{\Delta V} = \frac{C_1C_2}{C_2+C_1}$$

$Q(C_2+C_1) = \Delta V(C_1C_2)$
$QC_2 + QC_1 = \Delta VC_1C_2$
$QC_1 = \Delta VC_1C_2 - QC_2$
$QC_1 = C_2(\Delta VC_1 - Q)$
$\frac{QC_1}{(\Delta VC_1 - Q)} = C_2$

$Q = 450\times10^{-6}\,C$
$C_1 = 12\times10^{-6}\,F$
$\Delta V = 60V$

$C_2 = 20\,\mu F$

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